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# DSCP80

## Programmable Temperature Transmitter, DIN Mount



### Description

Each isolated DSCP80 transmitter is designed for measuring temperature using thermocouples or RTDs. The input type, measurement range, and other features are software configurable. A PC, the DSCX-887 and DSCX-416 interface cables, and the DSCX-895 configuration software are required to configure the transmitter. Communication is serial RS-232C.

The DSCP80 can interface to 12 industry standard thermocouple types: J, K, T, E, R, S, B, N, L, U, C, and D. Cold junction compensation is selectable as either internal or external. Three RTD types, Pt 100, Cu 50\*, and Ni 100, can be interfaced in a two, three or four wire connection. All inputs are linearized using up to 23 points of interpolation, and total errors are less than  $\pm 0.2\%$ .

Other configurable features include: zero point and input range adjustment, output response for open or short-circuit sensor or cable failure, normal or inverted output, ripple suppression for 50Hz or 60Hz, and output time response. The DSCX-895 configuration software allows query, print-out and saving of configuration settings, display of input measurement value, and display of interpolation table points.

\*Call factory for Cu RTD information.

### ► Features

- Interfaces to All Standard Thermocouples and RTDs
- Software Configurable Input Type and Range
- 2300Vrms Transformer Isolation
- Supply Voltage of 24 to 60VDC/AC or 85 to 230VDC/AC
- Open and Short-Circuit Input Detection
- Configurable with or without Power Connected
- Mounts on Standard DIN Rail
- -25°C to +55°C Operating Temperature

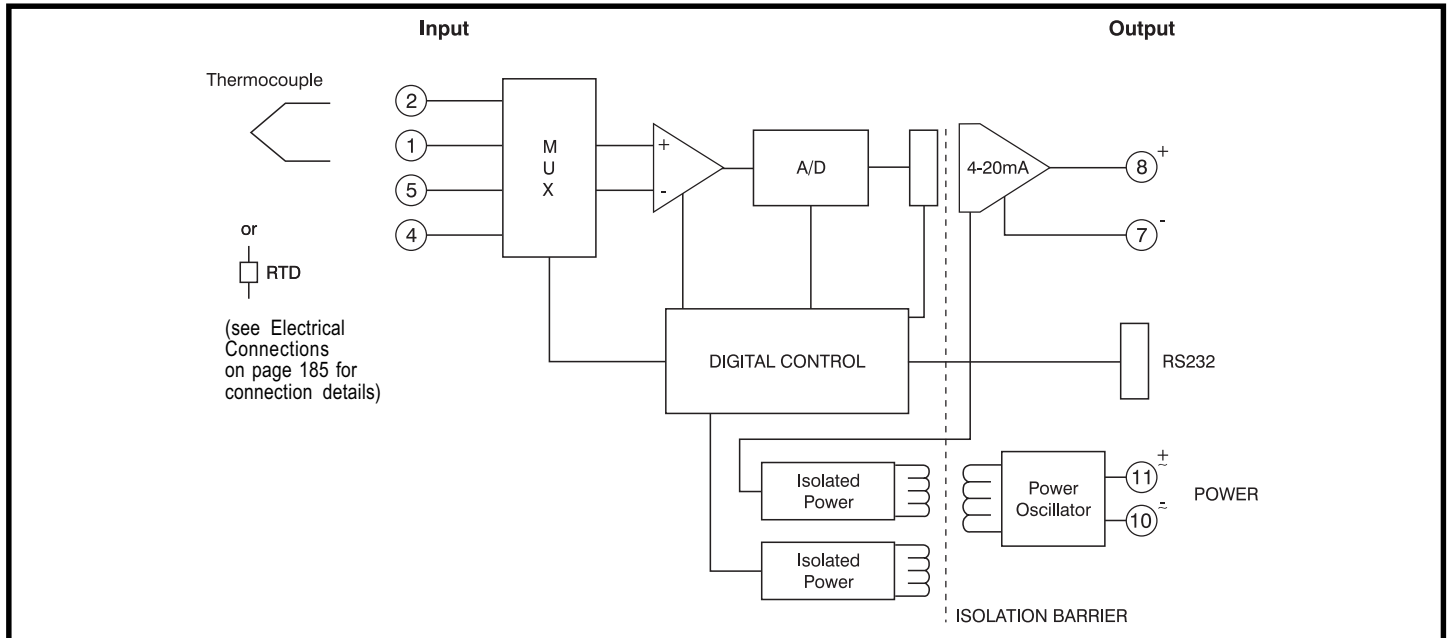


Figure 1: DSCP80 Block Diagram

### Thermocouple Type and Material

Type	Material
B	Pt30Rh-Pt6Rh
E	NiCr-CuNi
J	Fe-CuNi
K	NiCr-Ni
L	Fe-CuNi
N	NiCrSi-NiSi
R	Pt13Rh-Pt
S	Pt10Rh-Pt
T	Cu-CuNi
U	Cu-CuNi
C	W5 Re/W26 Re
D	W3 Re/W25 Re

**Specifications** Typical at T<sub>A</sub>=+25°C and 24VDC or 230VAC ±10% supply voltage, R<sub>L</sub>=300Ω (I<sub>OUT</sub>), R<sub>L</sub>=4kΩ (V<sub>OUT</sub>), PT100, 3-wire, 0-600°C

Module	DSCP80
Input Range, Thermocouple Thermocouple Types: B, E, J, K, N, R, S, T, L, U, C, D Cold Junction Compensation Internal External Input Resistance	Reference Table 1  Incorporated Pt 100 0 to 60°C, configurable >10MΩ
Input Range, RTD RTD Types: Pt 100, Ni 100 RTD Excitation Current Lead Resistance	Reference Table 1  ≤0.20mA ≤30Ω per lead
Output Range  Load Resistance  CMV, Input to Output CMV, Power Supply to In/Out Output Noise Open Circuit V, Short Circuit I  Output Response for Input Failure  Output Time Response	0/4 to 20mA, 20 to 0/4mA, 0/2 to 10V, 10 to 0/2V ≤600Ω current output mode, ≥2kΩ voltage output mode 2300Vrms, 1 min. 3700Vrms, 1 min. <1.5% p-p <20V current output mode, ≤40mA voltage output mode Configurable to hold value of output immediately prior to input failure, or value between 0 and 22mA, or 0 and 11V Configurable, see Table 2
Accuracy <sup>(1)</sup>	±0.1% Span Typ., ±0.2% Span max. <sup>1</sup>
Linearity	±0.03% Span Typ., ±0.1% Span max.
Stability	≤±(0.015%+0.015°C)/°C
Power Supply Voltage Tolerance Power Consumption	24 to 60VDC/AC, or 85 to 230VDC/AC DC -15% to +33%, AC ±15% DC ≤1.0W, AC ≤2.1VA
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity Emissions Immunity	-25°C to +55°C -40°C to +70°C 0 to 75% Noncondensing EN50081-2 (Radiated, Conducted) EN50082-2 (ESD, RF, EFT)
Mechanical Dimensions (h)(w)(d)	2.72" x 0.69" x 4.49" (69.2mm x 17.5mm x 114mm)
Housing Material	Lexan 940, Flammability Class V-0 acc. to UL 94
Mounting	DIN EN 50022-35x7.5 or -35x15

**†Additional Errors**

Low Measuring Range Resistance Thermometer (<200°C Span) Thermocouples (<500°C Span)		±0.015% Span Typ., ±0.05% Span max ±0.015% Span Typ., ±0.05% Span max
High Initial Value	Factor: Error:	±0.0002 Typ., ±0.0005 max (Factor)*(Initial Value/Span)*100 [%]
Influence of Lead Resistance		±0.01% per Ω
Internal Cold Junction Compensation		±(0.5°C/Span)*(100) [%]

NOTES:

- (1) Includes hysteresis, conformity and repeatability at reference conditions. Does not include CJC error.
- (2) Shipped as PT 100 for 3-wire connection, 0 to 600°C range, 4 to 20mA output, open circuit detect = 21.6mA output.
- (3) Shipped as PT 100 for 3-wire connection, 0 to 600°C range, 0 to 10V output, open circuit detect = 11.0V output.

**Ordering Information**

Model	Input Range/Description	Output Range
DSCP80-01 (Basic Configuration) <sup>(2)</sup>	User Configurable RTD or Thermocouple, 24 to 60VDC/AC Power	0/4 to 20mA, or Inverted
DSCP80-02 (Basic Configuration) <sup>(2)</sup>	User Configurable RTD or Thermocouple, 85 to 230VDC/AC Power	0/4 to 20mA, or Inverted
DSCP80-03 (Basic Configuration) <sup>(3)</sup>	User Configurable RTD or Thermocouple, 24 to 60VDC/AC Power	0/2 to 10V, or Inverted
DSCP80-04 (Basic Configuration) <sup>(3)</sup>	User Configurable RTD or Thermocouple, 85 to 230VDC/AC Power	0/2 to 10V, or Inverted
DSCP80-01/-03-xxxx (Contact Factory) <sup>(4)</sup>	Factory Configured RTD or Thermocouple, 24 to 60VDC/AC Power	0/4 to 20mA, 0/2 to 10V, or Inverted
DSCP80-02/-04-xxxx (Contact Factory) <sup>(4)</sup>	Factory Configured RTD or Thermocouple, 85 to 230VDC/AC Power	0/4 to 20mA, 0/2 to 10V, or Inverted

**Accessories**

Model	Description
DSCX-887	PC Interface Cable
DSCX-416	Module Interface Cable
DSCX-895	Configuration Software

**Table 1**

Measured Variables	Measuring Ranges		
	Limits	Min. Span	Max. Span
RTD: 2, 3, or 4-wire Pt 100, Standard IEC 60 751 Ni 100, Standard DIN 43 760	-200 to +850°C -60 to +250°C	50°C 50°C	850°C 250°C
Thermocouple Type B, E, J, K, N, R, S, T; Standard IEC 60 584-1  Type L and U; Standard DIN 43 710  Type C: W5 Re/W26 Re, Type D: W3 Re/W25 Re; Standard ASTM E 988-90	According to type	2mV <sup>(5)</sup>	80mV <sup>(5)</sup>

**Table 2: Output Response Times**

Measuring Mode	Open Sensor Circuit	Short-Circuit	Possible Response Times [s]							
			1.5	2.5	3.5	6.5	11	20.5	40	
TC int. comp.	active	–	1.5	2.5	3.5	6.5	11	20.5	40	
TC int. comp.	off	–	1.5	2.5	3.5	6.5	13.5	24.5	49.5	
TC ext. comp.	active	–	1.5	2.5	3.5	6.5	11	20.5	40	
TC ext. comp.	off	–	1.5	2.5	4	6.5	13.5	24.5	48.5	
RTD 2L	active	–	2	2.5	3	5	9.5	17.5	33.5	
RTD 3L, 4L	active	active	2	2.5	4	6.5	11.5	21	40.5	
RTD 2L, 3L, 4L	off	off	1.5	2.5	3.5	7.5	14	26.5	50.5	

- (4) Submit configuration form shown on page 183, and factory will assign part number prior to order entry.
- (5) Many different ranges may be programmed as long as the min/max limits are observed. For minimum range examples, a K type thermocouple could be programmed for +30°C to +78.5°C, or +100°C to +149°C, or +900°C to 995°C, and so on.

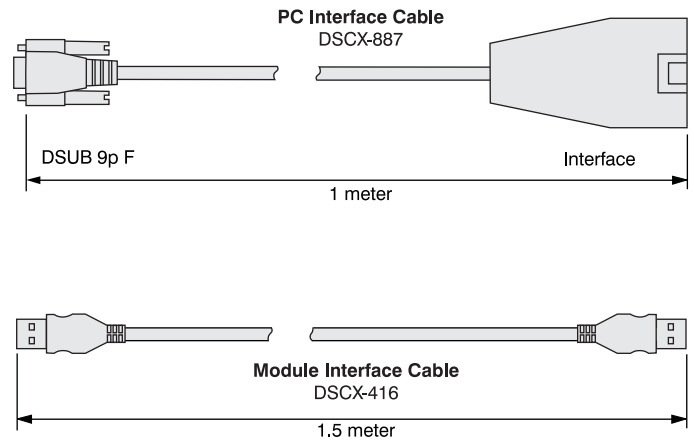
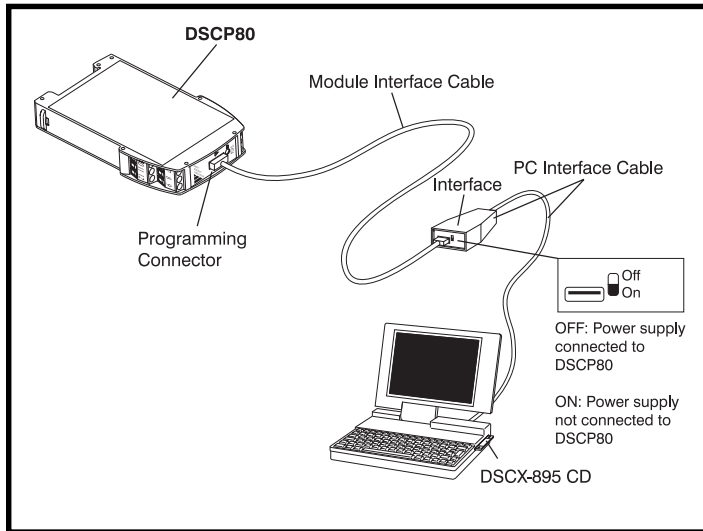
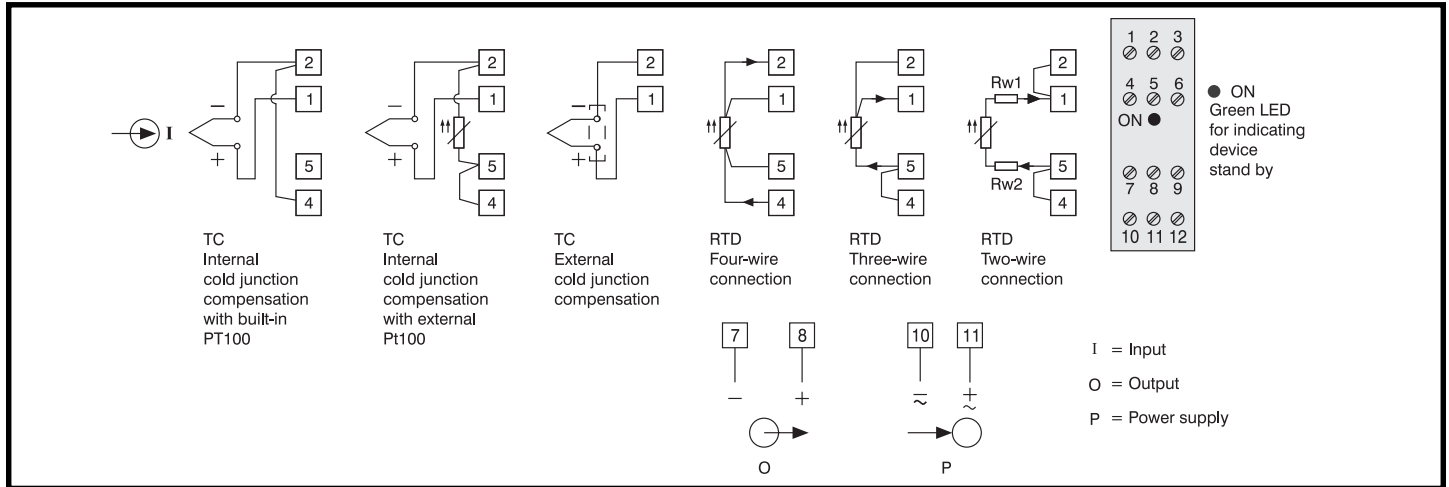
**Table 3: Specification and Ordering Information for Factory Configuration**

<b>Part Number:</b>	DSCP80-yy-xxxx yy = 01, 02, 03 or 04; xxxx is factory assigned part number	yy = _____ xxxx = _____
<b>Features, Selection</b>		
<b>1. Output variable</b>		
1) Current	end value 20 mA	<input type="checkbox"/>
2) Voltage	end value 10 V	<input type="checkbox"/>
<b>2. Temperature units</b>		
1) Temperatures in °C		<input type="checkbox"/>
2) Temperatures in °F		<input type="checkbox"/>
3) Temperatures in K		<input type="checkbox"/>
<b>3. Measuring mode, input connection</b>		
<b>Thermocouple</b>		
1) Internal cold junction compensation, with built-in or external PT100		<input type="checkbox"/>
2) External cold junction compensation by fixed junction temperature (see NOTE A)	Specify: _____ °	<input type="checkbox"/>
<b>Resistance thermometer</b>		
3) Two-wire connection, $R_L$ (see NOTE B)	Specify: _____ Ω	<input type="checkbox"/>
4) Three-wire connection, $R_L \leq 30\Omega$ /wire		<input type="checkbox"/>
5) Four-wire connection, $R_L \leq 30\Omega$ /wire		<input type="checkbox"/>
<small>NOTE A: Specify external cold junction temperature <math>t_c</math> (in °C, °F or K, acc. to selection in Feature 2), any value between 0 and 60°C or equivalent</small>		
<small>NOTE B: Specify total lead resistance <math>R_L</math> [Ω], any value between 0 and 60Ω</small>		
<b>4. Sensor type/measuring range</b>		
Sensor type/beginning...end value of measuring range*		Specify Range:
1) RTD Pt 100	Specify: _____ Ω (See Note)	_____ ° to _____ °
2) RTD Ni 100	Specify: _____ Ω (See Note)	_____ ° to _____ °
B) TC Type B	_____ ° to _____ °	N) TC Type N _____ ° to _____ °
E) TC Type E	_____ ° to _____ °	R) TC Type R _____ ° to _____ °
J) TC Type J	_____ ° to _____ °	S) TC Type S _____ ° to _____ °
K) TC Type K	_____ ° to _____ °	T) TC Type T _____ ° to _____ °
L) TC Type L	_____ ° to _____ °	U) TC Type U _____ ° to _____ °
C) TC W5-W26RE	_____ ° to _____ °	D) TC W3-W25RE _____ ° to _____ °
<small>NOTE: Specify resistance in Ω at 0°C, any value between 50 and 1000Ω *Specify measuring range in [°C], [°F], or [K]; refer to table 4 for max range operating limits for each type of sensor, table 1 for min/max span limits.</small>		
<b>5. Output characteristic</b>		
0) 20...100% end value	<input type="checkbox"/>	2) Inverted 100...20% end value <input type="checkbox"/>
1) 0...100% end value	<input type="checkbox"/>	3) Inverted 100...0% end value <input type="checkbox"/>
<b>6. Open-circuit sensor detection</b>		
Output response for an open or short-circuit* sensor		
0) Output → at start value + 110% of the span	<input type="checkbox"/>	2) Hold output at last value <input type="checkbox"/>
1) Output (see NOTE)	Specify: _____ %	3) No signal <input type="checkbox"/>
<small>NOTE: Any value between 0 to &lt;110% at dead-zero, resp. -10 to &lt;110% at live-zero *The short-circuit signal is only active for RTD measuring <math>\geq 100\Omega</math> at 0°C and three or four-wire connection</small>		
<b>7. Output time response</b>		
0) Standard response time approx. 2 seconds	<input type="checkbox"/>	
9) Response time (see Note)		Specify: _____ s
<small>NOTE: For admissible values see Table 2</small>		
<b>8. Mains ripple suppression</b>		
0) Frequency 50 Hz	<input type="checkbox"/>	
1) Frequency 60 Hz	<input type="checkbox"/>	

**Table 4: Temperature Measuring Ranges**

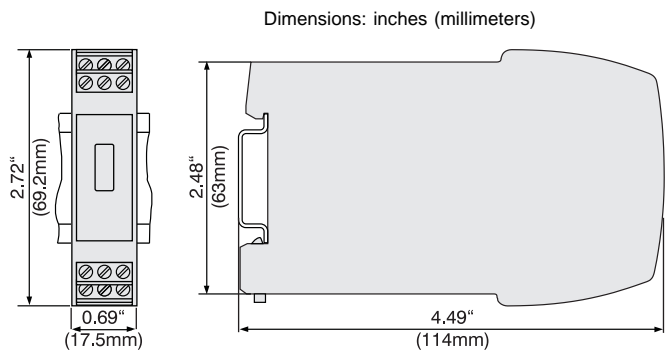
Measuring range examples [°C]	Resistance thermometers		Thermocouples											
	Pt100	Ni100	B	E	J	K	L	N	R	S	T	U	C <sup>(1)</sup>	D <sup>(2)</sup>
0...40	X			X	X		X							
0...50	X	X		X	X	X	X				X	X		
0...60	X	X		X	X	X	X				X	X		
0...80	X	X		X	X	X	X	X			X	X		
0...100	X	X		X	X	X	X	X			X	X		
0...120	X	X		X	X	X	X	X			X	X		
0...150	X	X		X	X	X	X	X			X	X	X	
0...200	X	X		X	X	X	X	X			X	X	X	X
0...250	X	X		X	X	X	X	X			X	X	X	X
0...300	X			X	X	X	X	X	X	X	X	X	X	X
0...400	X			X	X	X	X	X	X	X	X	X	X	X
0...500	X			X	X	X	X	X	X	X		X	X	X
0...600	X			X	X	X	X	X	X	X		X	X	X
0...800	X		X	X	X	X	X	X	X	X			X	X
0...900			X	X	X	X	X	X	X	X			X	X
0...1000			X	X	X	X		X	X	X			X	X
0...1200			X		X	X		X	X	X			X	X
0...1500			X						X	X			X	X
0...1600			X						X	X			X	X
0...1800			X										X	X
0...2000													X	X
50...150	X	X		X	X	X	X	X			X	X		
100...300	X			X	X	X	X	X			X	X	X	X
200...500	X			X	X	X	X	X	X	X		X	X	X
300...600	X			X	X	X	X	X	X	X		X	X	X
600...900			X	X	X	X	X	X	X	X			X	X
600...1000			X	X	X	X		X	X	X			X	X
900...1200			X		X	X		X	X	X			X	X
600...1600			X						X	X			X	X
600...1800			X										X	X
-10...40	X	X		X	X	X	X					X		
-30...60	X	X		X	X	X	X	X			X	X		
Measuring range limits [°C]	-200 to 850	-60 to 250	0 to 1820	-270 to 1000	-210 to 1200	-270 to 1372	-200 to 900	-270 to 1300	-50 to 1769	-50 to 1769	-270 to 400	-200 to 600	0 to 2315	0 to 2315
	<b>NOTE A</b>		<b>NOTE B</b>											
	<p><b>NOTE A:</b> Minimum span is 15Ω when the end value<sup>(3)</sup> is less than or equal to 400Ω.                      Minimum span is 150Ω when the end value<sup>(3)</sup> is greater than 400Ω and not exceeding 4000Ω.                      The ratio of the min value to the span must be less than or equal to 10.</p> <p><b>NOTE B:</b> Range of span is 2mV minimum to 80mV maximum. The ratio of the min value to the span must be less than or equal to 10.</p> <p><b>NOTE (1):</b> W5 Re W26 Re (ASTM E 988-90)  <b>NOTE (2):</b> W3 Re W25 Re (ASTM E 988-90)  <b>NOTE (3):</b> For two-wire connections, the end value is made up of the measured end value (Ω) plus the total resistance of the leads.</p>													

**Electrical Connections**



Example of the set-up for programming a DSCP80 without the power supply. For this case the switch on the interface must be set to "ON".

**Dimensions**



DSCP80 Clipped onto a Top-Hat Rail (35 x 15mm or 35 x 17 mm, acc. to EN 50 022).



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